ABSTRACT OF THE DISCLOSURE

[0035] Present invention discloses novel designs of carbon nanotube spin valve structures for incorporation into magnetic storage and magnetic sensing devices, such as magnetic read head, MRAM, and magnetic field sensor. One of the designs is an in-stack carbon nanotube spin valve, which consists of a ferromagnetic free layer and a ferromagnetic pinned layer. The two layers are physically separated, although they reside in parallel planes. A single or plurality of vertically aligned carbon nanotubes are in between the two layers, and in electrical contact with both. The other design is a planar carbon nanotube spin valve, which consists of ferromagnetic free layer and pinned layer in substantially the same plane. They are electrically connected by in-plane aligned carbon nanotubes, which reside in between. The methods of fabricating the magnetic read head and MRAM devices utilizing these types of carbon nanotube spin valves are also described.